

SYMPOSIUM LEAD INTRODUCTION PAPER

TITLE:

UBIQUITOUS SENSING FOR EXPOSURE ASSESSMENT IN ENVIRONMENTAL EPIDEMIOLOGY

Background and Aims

Exposure assessment has and continues to be a major weakness in Environmental Epidemiology. Due to the financial and logistical cost of personal monitoring, most epidemiologic studies have relied on surrogate estimates of exposure, usually assigned to the home location of study subjects. The errors in these exposure assignments probably bias results toward the null. This paper aims to supply a commentary and conjecture on the impact that ubiquitous sensing will have on exposure assessment in Environmental Epidemiology.

Methods

I rely on reviews of the literature undertaken from 2007 to the present. Specifically, I review novel developments in ubiquitous sensing that will lead to much greater ability to estimate the dose, rather than just the proxies for exposure to environmental contaminants or hazards.

Results

Many of the important opportunities that will guide exposure assessment for Environmental Epidemiology in the 21st century arise from innovations in related science and technology. Cell-phone technologies increasingly contribute to improving diagnostics and patient care through telemedicine. The major societal investments occurring in telemedicine will have beneficial spin offs for exposure assessment in epidemiological studies. Innovations from telemedicine are now spurring fields known as “ubiquitous”, “embedded” and “participatory” sensing. Working prototypes based on cell-phone technologies have already demonstrated capacity to measure physical activity, geographic position, lung function, and pollution exposures. Such technologies can also be woven into social networking systems to voluntarily capture and share data on environmental conditions and the human response while in the exposure field.

Discussion

Ubiquitous sensing offers tremendous promise for improved exposure assessment. Protection of personal privacy, analysis of the voluminous data generated by the sensors, and integration with other emerging methods from molecular epidemiology represent critical areas for research and development.

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